

Health and Environmental Impact of Textile Industry: A Case Study of Bhilwara District



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Abstract

Bhilwara District of Rajasthan and the adjoining areas are well known for textile industry. It produces about 75 percent of country's textile. There are about 500 synthetic textile units on the outskirts of Bhilwara on Chittorgarh, Gangapur and Mandal road involved in Dyeing, weaving and spinning, but there is a dark side too. The industry's poor effluent management system has long poisoned the area affecting air, surface, water, agricultural land and human health. *Poisoned Water(2004)*, a study by the public health engineering department found that most of the open wells in the villages near the Banas river that lies beside the industrial belt had chromium, lead, iron, zinc and sodium above the norm set by the Bureau of Indian Standards (Srinivasan, 2007). Lead is especially injurious to the brain and nervous system of developing children. These chemicals were similar to those found in textile unit's waste. Expert fear it will soon enter in the city's center and will start making ground water poisonous which is used for domestic purpose. Hence, this study analyzes the textile pollutants and their intensity on environment of Bhilwara Tehsil with respect to the socio-economic and demographic background. For the research, the primary survey included field visit and questionnaires. The secondary sources include various government reports, publications, journals and newspapers. Various measures to reduce pollution load in water bodies is been discussed later in the paper. Also, lots of work has to be done both in terms of policy formulation and implementation.

Keywords: Textile Industry, Environment Degradation, Water Pollution, Human Health, Banas Basin.

Introduction

The degradation of the environment due to the discharge of polluting wastewater from industrial sources is a real problem in several countries. This situation is even worse in developing countries like India where little or no treatment is carried out before the discharge. In spite of the many steps taken to maintain and improve the quality of surface and groundwater, the quantities of wastewater generated by these industries continue to increase and municipalities are confronted with an urgent need to develop safe and feasible alternative practices for wastewater management.

Textile industries are large industrial consumers of water as well as producers of wastewater. Increased demand for textile products, leads to increase in the generation of textile wastewater, which makes the textile industry as a main sources of severe pollution problems worldwide. The process of adding colour to the fibers is known as dyeing which normally requires large volumes of water not only in the dye bath, but also during the rinsing step. The process of dyeing involves the use of different chemicals. There are more than 5,000 chemical products associated with the dyeing process and over a lakh commercially available dyes exist. Nearly 1,000-4,000 m³ of waste water is generated after processing about 2-3 tonnes of textiles per day. These effluents are rich in dyes and chemicals, some of which are non-biodegradable and carcinogenic and pose a major threat to health and the environment if not properly treated. Wastewater generated in different production steps of a textile mill have high pH, temperature, detergents, oil, suspended and dissolved solids, dispersants, leveling agents, toxic and non-biodegradable matter, color and alkalinity. Important pollutants in textile effluent are mainly recalcitrant organics, color, toxicants and surfactants, chlorinated compounds (AOX). The textile wastewaters

are characterized by extreme fluctuations in many parameters such as chemical oxygen demand (COD), Biochemical oxygen demand (BOD), pH and colour.

Objectives of the Study

The main aim of research is to find out the impacts of textile industry on the water resources of Bhilwara Tehsil. Also, to analyze various environmental hazards and health problems associated with chemicals used in textile industry.

With escalating demand for textile products, textile mills and their wastewater have been increasing proportionally, causing a major problem of pollution in the district. Through this research paper, we tried to accomplish following objectives:

1. Locational analysis and Production in Textile mills of Bhilwara Tehsil.
2. Waste water generation & its disposal.
3. Impacts of Textile Industry on the Water Resources.

Health Problems and Environmental Hazards associated with the Industry.

Study Area

The study area includes the Bhilwara district which is located in the south-eastern center of Rajasthan. It lies between 25°1' to 25°58' North latitude and 74°3' to 75°25' East longitude. Its total geographical area is 10,455 square kilometers.

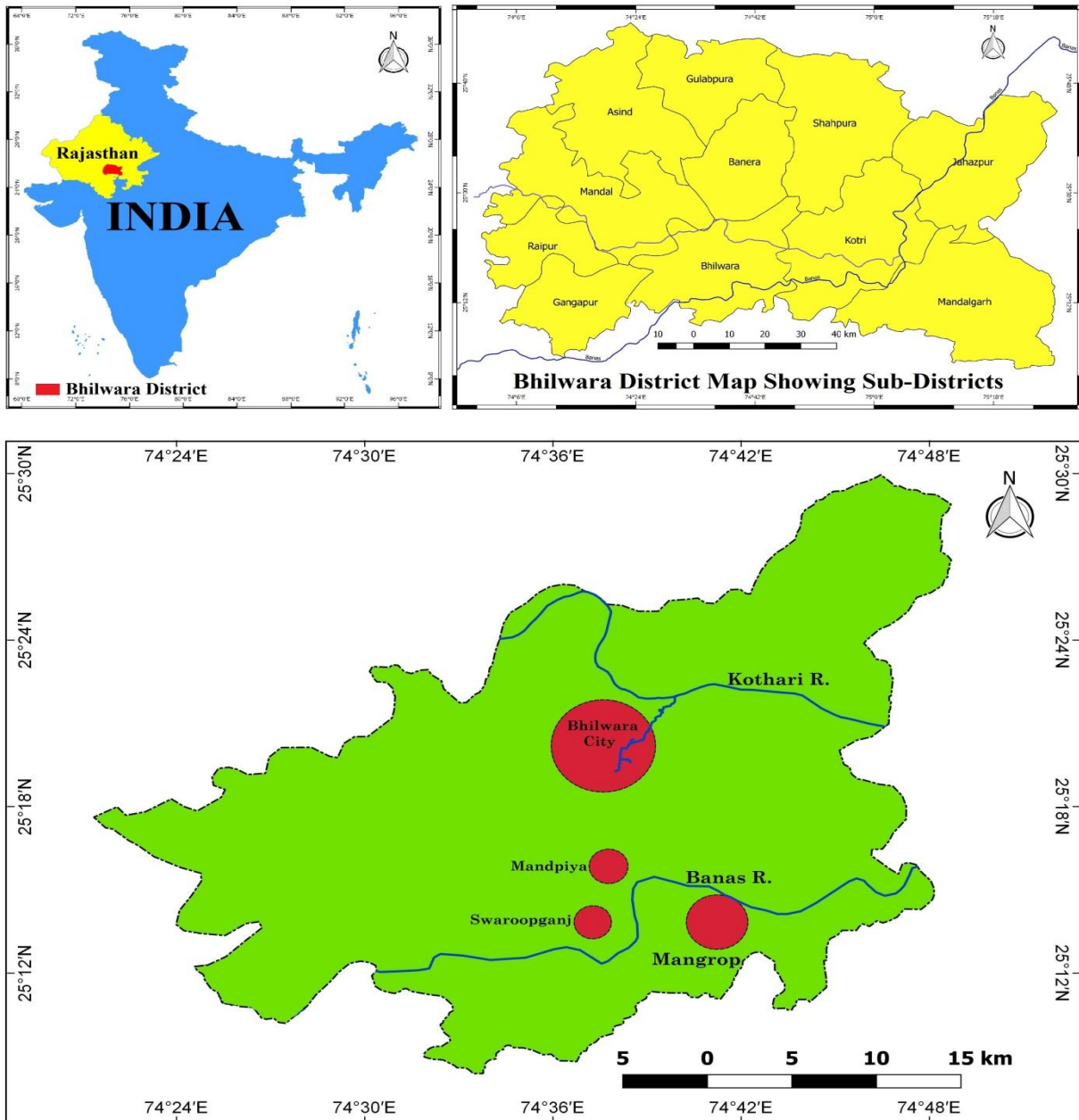


Fig 1: Study Area Map Showing Major Textile Industrial Region of Bhilwara Sub-District

Methodology

The study is based on primary information gathered using field surveys and questionnaires. For which the regional observation and interview support were primary data. For the purpose of collection of materials for the subject, we first collected subject matter from various books, government reports, reviewed journals and newspapers. Various departments related to the textile industry of the region and their published - unpublished materials were also helpful.

Review of Literature

Rajvanshy et al. (1978) examined the water quality and reported fluorosis in Rajasthan. They investigated water borne diseases in human with special references to fluorosis.

Saxena and Saxena (2013) studied about the fluoride contamination status in ground water in Bassi Tehsil of Jaipur district, Rajasthan and it was found that 74% ground water sources are unfit for drinking purpose due to higher fluoride contamination and also reported several cases of dental and skeletal fluorosis had appeared in this region. Saxena, S. and Saxena, U. (2013) Int. J. Env. Sci., 3(6) ; 2251-2260.

Çinar, and Demiröz(2005) explained the effluent discharge from textile and dyestuff industries to neighboring water bodies is presently causing significant health concerns to environmental regulatory agencies due to the toxicity, mutagenicity, and carcinogenicity of the dyes and their breakdown products. Çinar, Ö, "New tool for evaluation of performance of wastewater treatment plant: Artificial

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The ground water quality in Jahazpur Tehsil, Bhilwara, Rajasthan with reference to fluoride was evaluated and a comparison study of fluoride concentration in Banas river basin and Hilly terrain part of Tehsil was carried out by Meena et al. (2015 & 2016) 225-226 this study showed higher level of fluoride in river basin part of Tehsil. Meena, P. L., Meena, A. S., Meena, K. S., Jain, P. K. and Kumar, N. (2015) Der Chemica Sinica, 6(10); 19-24, 2015.

Development of Industrialization in Bhilwara District

The industrial development of Bhilwara district is divided into the following periods.

1. Before the First World War (before 1914)
2. Industrialization between the First and Second World War (1914 - 1945)
3. Industrialization between World War II and Plan period (1945 - 1951)
4. Industrial development during the plans (since 1951).

Status of Textile Industries in Bhilwara

About 300 small and large textile industries of Bhilwara district has 7200 powerlooms in which 22 crore metres of synthetic cloth, 18,342 metric tons of cotton yarn, 38,778 metric tonnes Synthetic & Man Made Yarn and 6800 Metric tonnes Carpet Yarn is being produced. The monthly turnover of Synthetic cloth trading is 150 crores INR (1.90 crore metre of cloth per month).

Table 1: Amount Invested & Proposed in Different Sectors of Textile Industries

S. No.	Item	No. of Industries	Invested Amount (In Crores)	Planned Amount (In Crores)
1	Cotton Thread	35	62	5300
2	Synthetic Yarn Construction	03	298	8393
3	Wool Worsted Yarn	04	71	980
4	Synthetic Thread	05	124	1467
5	Synthetic Cloths Weaving	32	58	1800
6	Processes House	18	68	4200
7	Total	97	681	22140

Source: MSME, Bhilwara

The study area has two cooperative mills producing cotton thread situated at Gangapur and Gulabpura respectively. The largest group in the field of synthetic textiles is L. N. J. (Lakshmi Niwas Jhunjhunu Wala) in which 5 industries are located namely B.S.L., Bhilwara spinners, Bhilwara Spinners & Weaving Mills Mandpam Bhilwara Processors, Rajasthan Spinning & Weaving Mills and Khari Gram (Mayur).

Stages of Thread Construction

The following basic procedures for making yarn from staple rays are used.

1. Clearing the fibers
2. Making the fiber more or less parallel
3. Forming a long strand of aligned fiber called silver
4. Inserting twice into the silver to form a yarn
5. Winding the complete yarn on a bobbin

Processes Involved in Textile Industry

The textile industry uses a large amount of water in its various processes and during this the

water gets polluted with the contents and chemicals used during production. According to a study, around 15 - 60 liters of water is required for the production of one-meter cloth that leads to an increase of 20 to 30 grams of B.O.D. (Bio-chemical Oxygen Demand) which in turn increase the organic content of Earth. The process of making cloth from yarn includes various steps such as sizing, designing, clearing, bleaching, mercerizing, dyeing and finishing which is a major cause of water pollution.

Sizing

In this process, the thread is used to strengthen the thread using materials like starch, glue, etc. During this process 5 to 10 nights per semester is immersed.

Designing

Starch is hydrolyzed. Caustic soda, soda ash and detergent are used in boilers. Most of the pollution occurs during this process.

Bleaching

In this process, oxidizing substances such as peroxides, hypochlorite's etc. are used. 10 percent of total pollution load is immersed during this process.

Mercerizing

It is passed through Caustic Soda's concentrated solution of 0.260g/L. And to remove this soda, it is washed with a sharp stream.

Dyeing

A variety of chemicals are used for different colored dyes. Color and chemical water are a means of pollution.

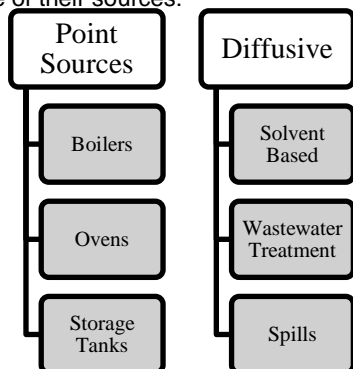
Environmental Impacts

Any industrial activity causes pollution in one form or the other and so is the textile industry. The impact of this industry on environmental aspects such as air, water, land and human body should be considered. The methodology used in processing houses of textile city Bhilwara is about 40 years old which is more polluting. The poisonous slurry emanating from these factories is not collected at the specified location. Fertile land has started becoming barren in many areas because of this polluted water coming from factories. Groundwater is also getting polluted due to gradual leaching in the ground. In our primary survey we also found that the water of the well has become saline and basic.

Air Pollution

Most processes performed in textile mills produce gaseous emissions. These have been identified as the second greatest pollution problem (after effluent quality) for the textile industry. Speculation concerning the amounts and types of air pollutants emitted from textile operations has been widespread but, generally, air emission data for textile manufacturing operations are not readily available. Air pollution is the most difficult type of pollution to sample, test, and quantify in a study.

Air emissions can be classified according to the nature of their sources:



Textile mills usually generate Nitrogen and Sulphur oxides from boilers. Other significant sources of air emissions in textile operations include resin finishing and drying operations, printing, dyeing, fabric preparation, and wastewater treatment plants. Hydrocarbons are emitted from drying ovens and from mineral oils in high-temperature drying/curing. These processes can emit formaldehyde, acids, softeners, and other volatile compounds. Residues from fibre preparation sometimes emit pollutants during heat setting processes. Carriers and solvents may be

emitted during dyeing operations depending on the types of dyeing processes used and from wastewater treatment plant operations. Carriers used in batch dyeing of disperse dyes may lead to volatilization of aqueous chemical emulsions during heat setting, drying, or curing stages. Acetic acid and formaldehyde are two major emissions of concern in textiles.

Land Pollution

The land on which this waste water spills off or which is been irrigated by this chemically contaminated water becomes barren. This indicates that chemicals used by the industry is harmful for environment and must be checked before releasing openly. Also, these chemicals leached down into the ground which contaminates ground water and wells. The crops have also been destroyed due to the use of this water in irrigation. The situation is even worse in the adjoining village around Kothari near Bhilwara, where these pollutants are impacting human health by entering in the food chain. The land fertility is been degraded day by day due to leaching down of these chemicals into it.

Water Pollution

The dirty water coming out of the process house contains harmful chemicals and colors. This dirty water along with muddy water flowing through the river Banas started affecting states's important Bisalpur water project. Approximately 75S tenter machines engaged in 18 processing units uses more than 2 million liters of water per day. Due to this heavy consumption there is a shortage of drinking water in Bhilwara town and it is increasing day by day. Along with this, ground water is declining rapidly.

Both the major rivers of this area, Banas and Kothari is in the grip of serious problem of this water pollution. Due to the report of the water department (water of river Banas is not potable) Harni Mahadev proposed drinking water scheme could not be implemented. Likewise, millions of gallons of polluted water coming out of these industries every day are polluting the river Banas, Kothari and other small rivers.

Mandapiya, Atoon, Aana, Sanaganer, Suvana, Hameergarh, Mangrop, Guawardi, Biliya, Patliyas, Peepli, Swaroopganj, Salriya and other village settled on Kothari and Banas river are affected from agricultural land and water pollution. If this doesn't get settled soon, then the same problem will arise from Samesh warghat (banas and Chambal leveling level) located in Khandhar tehsil of Sawai Madhopur district located next to Bisalpur Dam. A survey revealed that villages settled on northern slopes have more impact of pollution.

Impact on Humans

1. Agricultural activity in 8-10 other villages located downstream of the Banas river towards village Mangroop has reached a standstill.
2. The air smells foul and air borne diseases are increasing gradually.
3. Even the villager, who drew water from well and tube wells, use the area's polluted groundwater which lead to health problems like stomach disorders, gastroenteritis and skin disease.

4. Long term chemical exposure of workers, lack of proper safety gears and untreated waste disposal are the major causes of higher sickness and rise in death rates.

Measures to Control Pollution

To reduce the effect of pollution, it is lawful to set up a treatment plant for production units. It has been observed that either the plant has not been installed or it is not used. Besides this, the measures for controlling pollution from the textile business are as follows:

1. best flow system
2. processed based control
3. by substituting chemicals
4. by treating chemicals before discharging
5. by biological treatment

Conclusion

In this modern competitive world, the industries are maximizing their profits rather than focusing on the environmental problems and this can be seen in the Bhilwara District also. The textile industries here directly discharged the untreated waste water containing heavy materials such as arsenic, cadmium, Sulphur & nitrogen peroxides which are harmful as well as carcinogenic for human health. This pollution continues unabated even after pollution controlling agencies set norms for the units. The situation may worsen in the future which will affect the biotic community and spoil the whole ecosystem.

Suggestions

From the above study we can suggest various measures for individuals, companies and government. They are:

1. A waste treatment plant should be setup around industrial area as which will check the effluents from discharging into river.
2. The industries should be regularly inspected to check whether they are following the norms regulated by environment protection agency.
3. Workers should be provided with protective gears by the industries so that they will not be exposed to these chemicals.
4. Strict actions should be taken against those individuals and organization who violate the laws.

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